

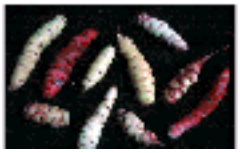


The Tomato

By Marty Vogt

Tomatoes are members of the Solanaceae, a family that includes such economically important plants as petunias, tobacco, chili peppers, sweet peppers, eggplant and potatoes as well as the mandrake and nightshades. Taxonomically, the tomato genus is closely related to *Solanum*. The two differ largely by certain minor characteristics of the anthers (Heiser 1969).

Although it is unclear where tomatoes may have been first domesticated, the two main possibilities are Peru and Mexico. The wild forms may have originated in either area, but it was the indigenous peoples of Mexico that first cultivated them. In fact, the common name tomato comes from *tomatl*, the word for this plant in the Nahuatl language of Mexico (Heiser 1969).

In his 1544 herbal, Matthiolus documents the existence of tomatoes in Italy and also reports that Italians ate them. Vernon Quinn proposes that the Spanish explorers brought it back to Spain from Mexico and that a Moor brought it to Tangiers and, from there, an Italian brought it to Italy where it was called Moor's apple, *pomo dei mori*, and a name with a similar sound, *poma amoris*, but a different meaning: love apple. Similarly, the French referred to it as love apple, *pomme d'amour* (Heiser 1969).

The French and Italian names demonstrate the story of tomato as a reversal of the tale of the Trojan horse. Although Matthiolus includes culinary use of tomatoes by the Italians, it was probably not widespread in the 16th century, as most Europeans were convinced that tomatoes were a lethal poison and/or an aphrodisiac, rendering them a danger both to spiritual and physical health. Their acceptance by Europeans as food was very slow, lasting more than a hundred years in much of Europe. Tomatoes were recognized as members of Solanaceae, whose only European relatives were the poisonous mandrake and nightshades, hence the strong aversion to eating them. It is likely that Italians preceded other non-Americans in cooking with tomatoes. Jack Weatherford (1988) suggests that the Italian diet was quite dull before they began using tomatoes and sweet peppers from the Americas: they had a lot of variety to their pastas, but only a few sauces. They liked the chili peppers from the New World, but these lost much of their flavor in sauces based in cream, butter or oil. Once they began to use tomatoes with sweet and chili peppers, they quickly developed hundreds of sauces from pickled, sliced, chipped, diced, dried

and pureed tomatoes.

Tomatoes were introduced to England in the 1570s and remained as a garden curiosity there for many years (Thacker 1979). The building of glasshouses during the 1800s had a great impact on British diet and lifestyle. Many of these glasshouses were built there in that century, especially during the second half, and the most popular items to put in them were flowers or tomatoes. A new truck farming industry sprang up in Britain to feed its burgeoning cities; by 1900, one grower alone had 76 acres-of glasshouses (Webber 1968). During this same period, the eating of tomatoes in the United States was slowly increasing, and some people of both nations maintained their aversion to the new food (Gould 1974).

The current popularity of the tomato as a food and as a cash crop belies its cool reception in Europe. About this crop, Ruben Villareal (1980) states, "Production of the tomato can be an especially profitable way to utilize limited land resources and abundant labor. It can be grown in a household garden, it can contribute substantially to the family's income on an extremely small area of land, or it can be grown on a large scale for urban markets and for processing. The tomato fits well into many cropping patterns and may bring in needed cash during periods when cereals and other staples cannot be grown and when labor is surplus. Near large towns and cities, the fresh vegetable market can be particularly lucrative".

Tomatoes are being grown as well on a very large scale and most of this crop is produced for processing. In the United States, 7,180,000 tons of tomatoes were produced in 1985, a crop valued at $66 per ton (Tigchelaar 1990). In that year, 87% of the U.S. crop was grown in California, where it was "the number one vegetable crop" (Sims 1987). The large scale crop is mechanically harvested, a system that began in the 1960s and which greatly increased production. Continued advancement in machinery provides a modern version which replaces the visual inspection of the harvest: the machine has four photosensors which read the color of the fruit and expel green ones (Manfredi 1990).

Few earthly plants have traveled in outer space, but tomatoes have. Twelve and a half million seeds of *Lycopersicon* were put into orbit by the Space Shuttle Challenger on 7 April 1984. After these seeds were returned to earth, they were germinated and grown by student researchers across the United States to visually observe whether the seeds had been affected by cosmic radiation, weightlessness or the increased gravity during launch and landing. Tomato seed were chosen for their small size and because tomato plants are easy to grow and familiar to the researchers (NASA 1990).

Biotechnology holds the future of tomatoes. The extensive germplasm collection maintained by Charles M. Rick of the University of California at Davis combined with the detailed knowledge of tomato genetics makes it an ideal plant for molecular research as well as horticultural development. Extensive molecular research has been conducted on other members of the Solanaceae, making the family a favorite and something of a standard for transformation, tissue culture, somaclonal variation and regeneration of protoplasts (Nevins 1987).

Soluble solids comprise approximately 75% of the dry weight of tomatoes. Of the soluble solids, approximately 65% is glucose and fructose. The percent of soluble solids within the cultivated

lycopersicon esculentum is often near 5%, varying from 4.1% to 10%. Soluble solids content has been increased in recent years by using the stock of wild South American species, especially *L. parviflorum* and *L. chmielewskii* (Hewitt 1987). The result has been a sweeter tomato and a higher yield for catsup, tomato paste and tomato sauce.

Genetic engineering has brought dramatic changes in recent tomato crops. Marketing of tomatoes with rearranged genetic stock will probably begin in 1994. Calgene has reduced the amount of the enzyme polygalacturonase (PG) in its new "flavr savr" tomato because this enzyme breaks down pectin which allows the fruit to soften. Delayed softening means that the fruit can remain on the vine and ripe more completely before harvesting (Redenbaugh 1992).

Just as the 16th century Europeans were highly suspicious of tomatoes, so have 20th century United Stations been of modern tomato agriculture. Growers have been harvesting green tomatoes for decades because these will survive shipment more easily than ripe fruit. Early harvest does not allow the full flavor of the fruit to develop. And growers turned to the pearshaped varieties for easy handling with machine harvesters and they began marketing a food that many consumers wouldn't recognize; A very vocal resistance is currently being expressed to genetically engineered foods (Pendick 1993) and the reception of the new tomatoes by the general public will depend to a large extent on flavor, texture and visual appearance.

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